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A KEY TO ATLANTIC SPECIES OF THE GENUS *CYPSELURUS*, WITH A NEW FLYING-FISH FROM THE CLEVELAND MUSEUM'S 'BLOSSOM' EXPEDITION

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Two specimens of the genus *Cypselurus* from the Atlantic, collected by the 'Blossom' Expedition of the Cleveland Museum, 1923–1926, have been courteously turned over to us for study. One seems to represent an undescribed form, the other, *Cypselurus lineatus*, a little-known species. In comparing them with other material, as well as with world literature, sufficient data has been accumulated to enable us to construct a key to Atlantic Ocean species of the genus. We believe we have now examined all described and recognizable forms of *Cypselurus* from that region.[1]

Cypselurus bahiensis (Ranzani)

For purposes of comparison, we have drawn up a description of a specimen of *Cypselurus bahiensis* from the Bingham Oceanographic Collection (No. 124, Caribbean Sea), as follows:

Length to base of caudal, 230 mm. Depth in this length, 5.4; head, 4.2; pectoral, 1.3; ventral, 3.6. Eye in head, 3.3; snout, 3.6; interorbital, 2.8; maxillary, 4; width of head, 2; width of body, 1.8; depth of peduncle, 3.2; dorsal base, 1.4; anal base, 2.2; longest dorsal ray, 2.7; longest anal ray, 4.2; lower caudal lobe 0.8 (est.; broken). Anal base in dorsal base, 1.5.

Dorsal, 13½; anal, 11½. Lateral line, 55; predorsal scales, 37.

The pectoral reaches to the origins of the caudal; ventral to base of ninth anal ray; its insertion being midway between base of caudal and middle of opercle, or midway between last anal ray and middle of pectoral base. Dorsal origin at two-thirds the distance from middle of preopercle to caudal base; anal origin behind dorsal origin by about the diameter of eye.

Cypselurus minos, new species

DESCRIPTION OF TYPE.—No. 72, Blossom South Atlantic Expedition; from Mindelo, St. Vincent, Cape Verde Islands, purchased December 21, 1923.

Length to base of caudal, 335 mm. Depth in this length, 6.4; head, 4.7; pectoral, 1.6 (est.; the fins are broken); ventral, 3.8 (est.). Eye in head, 3.8; snout,

[1]Amer. Mus. Nat. Hist., 5 species; Bingham Oceanographic Mus., 2 species; Cleveland Mus., 2 species.

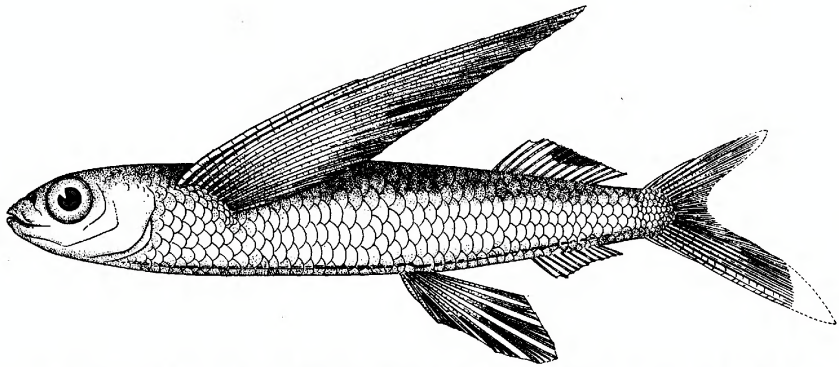

Fig. 1. *Cypselurus bahiensis* (Ranzani). Specimen 230 mm. standard length, No. 124, Bingham Oceanographic Collection.

3.3; interorbital, 2.6; maxillary, 4.4; width of head and of body, 1.8; depth of peduncle, 3.8; dorsal base, 1.4; anal base, 2; longest dorsal ray, 2.2 (est.); longest anal ray, 2.8 (est.); lower caudal lobe, 0.9 (est.). Anal base in dorsal base, 1.5.

Dorsal, 11; anal, 9½. Lateral line, 65±; predorsal scales, 38. Jaw teeth conic, scarcely or not at all curved, monocuspid; lower jaw teeth not as acutely pointed as upper; no palatine teeth.

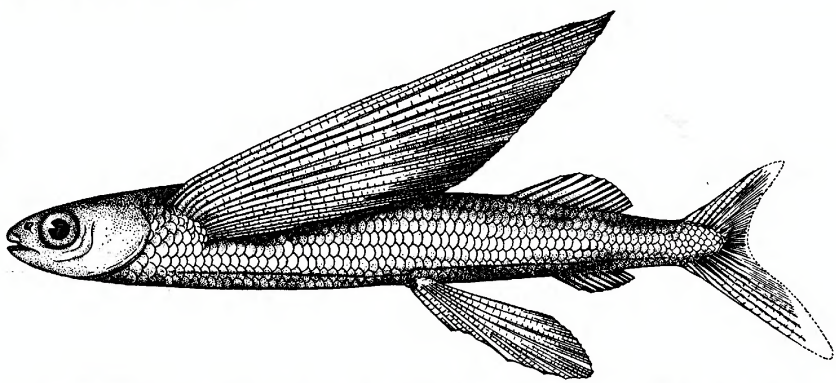

Fig. 2. *Cypselurus minos*, new species. Type, 335 mm., standard length.

Head broad and flat above; snout pointed for a *Cypselurus;* mouth very small. Second pectoral ray divided; fin (broken) reaching to at least last dorsal ray; ventrals reaching to base of last anal ray, inserted midway between base of caudal and middle of opercle, and midway between base of last anal ray and axil of pectoral; dorsal origin at two-thirds the distance from middle of opercle to caudal base; anal origin behind dorsal origin by a distance slightly less than diameter of eye.

Color in alcohol, dusky above, lighter below. Pectorals uniform dusky with a small light spot or bar near middle of last rays; ventrals uniform dusky; anal grayish.

This species is related to *C. bahiensis* and would be referred to same on the basis of current "keys"; see, however, our analysis of Atlantic species of the genus (p. 5) for the differences. Because of the lack of a good figure of true *C. bahiensis*, one is given here (Fig. 1) for purposes of comparison. It is based on material of the Bingham Oceanographic Collection.[1]

Cypselurus lineatus (Cuvier and Valenciennes)

A large specimen of this little-known species, with type-locality in West Africa and also recorded from Bermuda, is described below. Very likely it comes from the Cape Verde Islands also, but unfortunately the accompanying data has been lost.

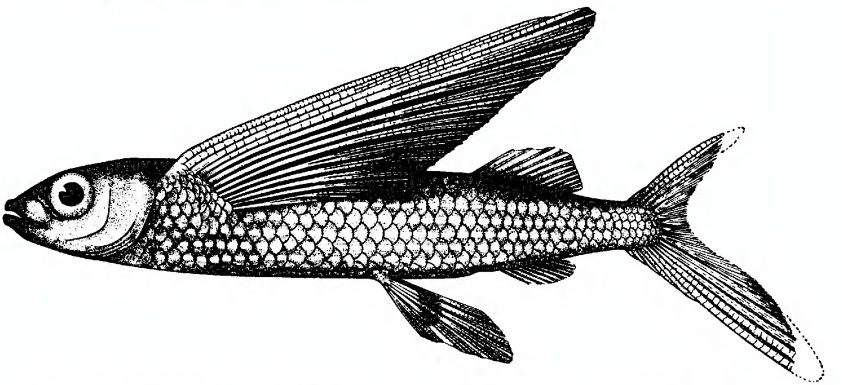

Fig. 3. *Cypselurus lineatus* (Cuvier and Valenciennes). Specimen 350 mm., standard length.

Length to base of caudal, 348 mm. Depth in this length, 5.8; head, 4.3; pectoral, 1.5; ventral, about 4. Eye in head, 3.4; snout, 3.2; interorbital, 2.6; maxillary, about 3.4; width of head, 1.7; width of body, 1.6; depth of peduncle, 3.7; dorsal base, 1.5; anal base, 2.2; longest dorsal ray, 3.1; longest anal ray, 3.8; lower caudal lobe (est.; broken), 0.8; anal base in dorsal base, 1.5.

Dorsal, 11½; anal, 10. Lateral line, about 60; predorsal scales, about 37. Jaw teeth long and slender, with sharp, curved tips, monocuspid; teeth of lower jaw slightly longer, and more curved than upper; palatine teeth present.

Head broad and flat above; snout pointed for a *Cypselurus*, but less pointed than in *C. minos*. Second pectoral ray divided; fin reaching to the depressed last ray of dorsal; ventrals reaching to the first third of anal base; inserted midway between base of caudal and middle of preopercle; and midway between base of last anal ray and first third of pectoral base. Dorsal origin at two-thirds the distance from middle of eye to caudal base; anal origin behind dorsal origin by a distance about equal to the diameter of eye, and a little nearer ventral insertion than to base of caudal.

[1]Breder, 1927, Bull. Bing. Oceanographic Coll., I, Art. 1, p. 22.

Color in alcohol: dusky above, lighter below, sides and belly with light dotted lines along each scale row. These are decidedly more prominent than in any other species of the genus known to us, and are formed of pearl-gray spots, one to a scale, on a darker ground color. Pectorals pale at inner edge, otherwise dusky; ventrals with an irregular blackish bar or blotch at inside edge proximal to middle of fin which is grayish, paling distally. Dorsal, anal, and caudal uniform dusky.

Teeth of Atlantic Species of *Cypselurus*

With the figures of jaw teeth given in Breder and Nichols,[1] and those shown in Fig. 4, the teeth of all Atlantic *Cypselurus* have been illustrated. The following figures complete the accompanying tabular data given in the above-mentioned paper, which see.

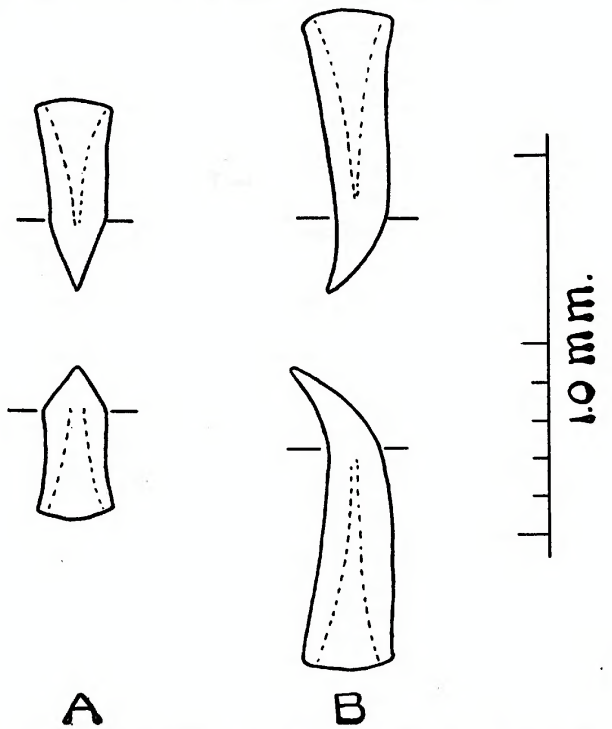

Fig. 4. Jaw teeth of (A) *Cypselurus minos* and (B) *Cypselurus lineatus*. Microscope sketches.

	U.	L.	S.L.	Ratio
Cypselurus lineatus	.75	.80	350	0.00221
" *minos*	.50	.40	335	0.00134

[1] Breder and Nichols, 1930, Amer. Mus. Novitates, No. 417, p. 8, Fig. 5.

KEY TO ATLANTIC SPECIES OF THE GENUS *Cypselurus*

I. (*Cypselurus*). Second pectoral ray divided; third and fourth longest; muzzle not especially broad and short.

A. Jaw teeth with distinct cusps, bicuspid or tricuspid; vertical fins without pattern; ventral insertion midway between caudal base and eye, or near eye; no barbels.

B. Ventral insertion midway between base of caudal and a pupil's diameter behind eye; pectoral pale, without pattern; tooth ratio, 0.00165; teeth tricuspid..... *vitropinna.*

BB. Ventral insertion midway between base of caudal and middle or posterior margin of eye; pectoral, dusky or patterned.

C. Base of anal, two times in base of dorsal; tooth ratio, 0.00068; teeth bicuspid..... *lutkeni.*

CC. Base of anal, one and two-third times in base of dorsal; tooth ratio, 0.00060; teeth tricuspid..... *heterurus.*

AA. Jaw teeth without distinct lateral cusps, monocuspid; vertical fins with or without pattern; barbels present or absent.

D. Mandibular barbels present; pectorals or ventrals, or both, with a definite pattern; anal base, 1.5 in dorsal base.

E. Barbels short and membranous, dark-colored; both pectorals and ventrals with a broad white cross-bar on a dark field (mottled in the young), vertical fins plain; dorsal low; ventral insertion midway between base of caudal and center of eye; tooth ratio, 0.00090..... *furcatus.*

EE. Barbels long, with a light-colored, central rib edged on either side by dark fluting; pectorals black, ventrals with the distal one-third abruptly black, dorsal nearly all black, anal with a black spot and caudal mottled; dorsal high; ventral insertion midway between base of caudal and edge of preopercle; tooth ratio, 0.00211..... *monroei.*

DD. No mandibular barbels.

F. Upper caudal lobe whitish, lower blackish; posterior part of dorsal abruptly black; pectorals dark; ventrals inserted midway between base of caudal and posterior margin of eye; tooth ratio, 0.00132..... *smithi.*

FF. Both caudal lobes dusky, paired fins with indistinct pattern, if any, dorsal not abruptly black posteriorly; ventral insertion midway between base of caudal and some point behind eye.

G. Sides and belly without distinct rows of pale spots; ventral insertion midway between base of caudal and middle of operculum.

H. Dorsal fin with a roundish dark blotch; inserted at one-third the distance from base of caudal to middle of preoperculum; ventral insertion midway between base of caudal and middle of operculum; tooth ratio, 0.00246..... *bahiensis.*

HH. Dorsal fin plain dusky, inserted at one-third the distance from base of caudal to middle of opercle; ventral insertion midway between base of caudal and middle of opercle; tooth ratio, 0.00134.. *minos.*

GG. Sides and belly with distinct rows of pale spots; ventral insertion midway between base of caudal and margin of preopercle; tooth ratio, 0.00221..... *lineatus.*

II.—(*Prognichthys*[1]). Second pectoral ray simple, third divided, fourth and fifth longest; muzzle broad and short..... *gibbifrons.*

This key cannot be considered as fully expressing the phylogenetic relationships of the forms treated, which relationships are as yet but vaguely understood. However, it succeeds in assembling the nine species into three groups, each of which is characterized by certain structural elements which are evidently expressions of genetic affinity. The first three (*lutkeni*, *vitropinna* and *heterurus*) all have distinct secondary cusps on the jaw teeth, while the rest have monocuspid teeth; and their fins have a certain simplicity of pattern shared by the third group. Fishes of the second group (*furcatus* and *monroei*) show complicated and ornate fin patterns, remain at a permanently small size, and possess barbels throughout life. The third group (*smithi*, *bahiensis*, *minos*, and *lineatus*) agrees with the first in matter of pattern, except *smithi* which approaches the second in this respect and may be permanently a small fish. The others attain the largest size of Atlantic *Cypselurus*, and all differ from the first group in having monocuspid jaw teeth.

These differences and similarities (of adult material) may be set forth as follows:

SIZE	Medium.....	Small.....	Large
WING PATTERN	Plain.....	Elaborate.....	Plain
TEETH	With Cusps	Without Cusps	
BARBELS	None[2]	Present	None
SPECIES	*lutkeni, heterurus, vitropinna*	*furcatus, monroei*	*smithi, minos, bahiensis, lineatus*

SYNONYMY

Cypselurus lutkeni (Jordan and Evermann)

Exocoetus lutkeni JORDAN AND EVERMANN, 1896, Bull. U. S. Nat. Mus., XLVII, part 1, p. 736. Cuba.

Exocoetus robustus JORDAN AND MEEK, 1886, Proc. U. S. Nat. Mus. for 1885, VIII, p. 61. Cuba. Probably not of Günther, 1866, 'Cat.,' VI, p. 289. Australia.

[1]Breder, 1928, Bull. Bing. Oceanographic Coll., II, Art. 2, p. 20, which see. Should perhaps stand as a subgenus, but is sufficiently distinct from the species herein discussed to warrant omission from this analysis.

[2]This group may possibly have barbelled young, such having been described for *heterurus*.

Cypselurus vitropinna Breder

Cypselurus vitropinna BREDER, 1927, Bull. Bingham Oceanog. Mus., I, Art. 1, p. 20, Fig. 1. West Indies.

Cypselurus heterurus (Rafinesque)

Exocoetus heterurus RAFINESQUE, 1810, 'Caratteri di Alcuni Nuov. Gen., etc.,' p. 58. Palermo. JORDAN AND EVERMANN, 1896, Bull. U. S. Nat. Mus., XLVII, part 1, p. 735. Atlantic Ocean, both coasts.

Exocoetus comatus MITCHILL, 1815, Trans. Lit. and Phil. Soc. N. Y., p. 448, Pl. V, fig. 1. New York. Apparently a young form, with long mental barbel.

Exocoetus noveboracensis MITCHILL, 1814, Amer. Monthly Mag., II, p. 233. New York.

Exocoetus appendiculatus WOOD, 1824, Journ. Acad. Nat. Sci. Phila., p. 283, Pl. XVII, fig. 24. Southeast coast United States (young).

Exocoetus melanurus CUVIER AND VALENCIENNES, 1846, 'Hist. Nat. Poiss.,' XIX, p. 101. New York.

Cypselurus lutkeni SMITH, 1907, 'Fishes North Carolina,' p. 167, Fig. 66; not of Jordan and Evermann, 1896, or Breder and Nichols, 1930.

Cypselurus furcatus (Mitchill)

Exocoetus furcatus MITCHILL, 1815, Trans. Lit. and Phil. Soc., N. Y., I, p. 149, New York (young).

Exocoetus nuttalli LE SUEUR, 1821, Journ. Acad. Nat. Sci. Phila., p. 10, Pl. IV, fig. 1. Gulf of Mexico.

Exocoetus (*Cypselurus*) *procne* DE FILIPPIE VERANY, 1857, Mem. Acad. Sci. Torino, (2) XVIII, p. 10. Nice.

Exocoetus maculipinnis VINCIGUERRA, 1883, 'Risult. ittiol. del Violante,' p. 113, Pl. I, fig. 6. Tunis.

Exocoetus nigricans BENNETT, 1840, 'Whaling Voyage,' II, p. 287. In part (tropical Atlantic).

Exocoetus spilopus CUVIER AND VALENCIENNES, 1846, 'Hist. Nat. Poiss.,' XIX, p. 118. La Rochelle; St. Helena; West Indies; India; Arabia; DeWitt Land.

Cypselurus monroei Nichols and Breder

Cypselurus monroei NICHOLS AND BREDER, 1928, Zoologica, VIII, No. 7, p. 432. Fig. 167. Florida.

Cypselurus smithi Breder and Nichols

Cypselurus smithi BREDER AND NICHOLS, 1930, Amer. Mus. Novitates, No. 417, p. 4, Fig. 3. North of Bahamas.

Cypselurus bahiensis (Ranzani)

Exocœtus bahiensis RANZANI, 1842, Nov. Comm. Ac. Sci. Inst. Bonon., V, p. 362, Pl. XXXVIII. Bahia.

Exocoetus vermiculatus POEY, 1861, 'Memorias,' II, p. 300. Cuba.

?*Exocœtus parræ* POEY, 1868, 'Synopsis,' p. 385. Cuba. Insufficient description.

Exocœtus cyanopterus CUVIER AND VALENCIENNES, 1846, 'Hist. Nat. Poiss.,' XIX, p. 98. Bahia; Rio de Janeiro.

Exocœtus albidactylus GILL, 1863, Proc. Acad. Nat. Sci. Phila., p. 167. Caribbean Sea (erroneously ascribed to Panama).

Cypselurus minos Nichols and Breder

Cypselurus minos NICHOLS AND BREDER, 1930, Amer. Mus. Novitates, No. 428, p. 1, Fig. 2. Cape Verde Is.

Cypselurus lineatus (Cuvier and Valenciennes)

Exocœtus lineatus CUVIER AND VALENCIENNES, 1836, 'Hist. Nat. Poiss.,' XIX, p. 92. Gorée; Canaries. GOODE, 1876, Bull. U. S. Nat. Mus., V, p. 76. Bermudas.